



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>H04Q 7/38</b>		A1	(11) International Publication Number: <b>WO 00/69202</b> (43) International Publication Date: 16 November 2000 (16.11.00)
<p>(21) International Application Number: <b>PCT/EP00/03486</b></p> <p>(22) International Filing Date: 18 April 2000 (18.04.00)</p> <p>(30) Priority Data: 9910698.1 7 May 1999 (07.05.99) GB</p> <p>(71) Applicant (<i>for all designated States except US</i>): NOKIA NETWORKS OY [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (<i>for US only</i>): KATZ, Marcos [AR/FI]; Aleksanterinkatu 15 a 7, FIN-90100 Oulu (FI). HORNEMAN, Kari [FI/FI]; Kajantie 36, FIN-90800 Oulu (FI). PEKONEN, Johanna [FI/FI]; Otsolahdentie 7 D 45, FIN-02110 Espoo (FI). STAACK, Jens [FI/FI]; Klaneettitie 12 D 54, FIN-00420 Helsinki (FI).</p> <p>(74) Agent: STYLE, Kelda, Camilla, Karen; Page White &amp; Farrer, 54 Doughty Street, London WC1N 2LS (GB).</p>		<p>(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b>  <i>With international search report.</i>  <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> </p>	
<p>(54) Title: COMMUNICATION SYSTEM AND METHOD FOR PROVIDING COMMUNICATION SERVICES BASED ON LOCATION OF MOBILE STATIONS</p> <p>1 - Determination of co-ordinates (MS positioning) by BS      2 - BS transmits the co-ordinates (x,y) to Radio Network Control      3 - Classification: MS belongs to region C<sub>j</sub>      4 - The set of functions to be disabled/enabled and/or forced is determined from the definition of region C<sub>j</sub>      5 - The coded information is transmitted to MS</p>			
<p>(57) Abstract</p> <p>A communications system for providing communications over a first area, said system comprising means for assigning first information to said first area, said first information being for controlling communications in said first area; means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas; means for assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas, wherein the position of a communications device is arranged to be determined, the accuracy of the determination of the position of the user determining if one or more elements of said communications system is controlled in accordance with the first, second and/or third information.</p>			

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**TITLE**

COMMUNICATION SYSTEM AND METHOD FOR PROVIDING COMMUNICATION SERVICES BASED ON LOCATION OF MOBILE STATIONS

**FIELD OF THE INVENTION**

10 The present invention relates to communication systems and in particular, but not exclusively, to wireless cellular communication networks.

**BACKGROUND OF THE INVENTION**

15

In wireless cellular telecommunication networks, the area covered by the network is divided into a plurality of cells. Each cell is served by a base station which transmits signals to and receives signals from mobile stations in the associated cell. These mobile 20 stations can be mobile telephones or any other type of mobile terminal such as a portable computer with telecommunication capabilities.

For various reasons, it is undesirable to use mobile stations in 25 certain locations. For example, for safety reasons, mobile stations should be switched off when there is a likelihood that the radio signals could interfere with equipment. The strength of the signals transmitted by a mobile station are relatively strong in the immediate vicinity of the mobile station and are typically 30 much stronger than the signals from the base station which are received by the mobile station. For this reason, mobile stations should be switched off in aeroplanes, petrol (gas) stations, hospitals and the like.

35 In other situations, it is desirable for mobile stations to be switched off for social reasons. For this reason mobile stations should be switched off when a user is in a theatre, some meetings and the like.

5 However, the user must manually switch off his mobile station in these circumstances. If the user forgets to switch off his mobile station or was not aware that he should switch off his mobile station, this could lead to problems.

10 It has been proposed to provide devices which cause the mobile station to automatically switch off a mobile station when the mobile station enters the vicinity of the device.

15 A problem exists in defining those areas in which the mobile station is to be controlled particularly with reference to those areas where the mobile station is freely usable.

#### SUMMARY OF THE INVENTION

20 It is an aim of embodiments of the present invention to address the problems outlined hereinbefore.

According to one aspect of the present invention, there is provided a communications system for providing communications over a first area, said system comprising means for assigning first information to said first area, said first information being for controlling communications in said first area; means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas; means for assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas, wherein the position of a communications device is arranged to be determined, the accuracy of the determination of the position of the user determining if one or more elements of said communications system is controlled in accordance with the first, second and/or third information.

40 According to a second aspect of the present invention there is provided a communications system for providing communications

5 over a first area, said system comprising means for assigning  
first information to said first area, said first information  
being for controlling communications in said first area; means  
for assigning second information to one or more second smaller  
areas of said first area, said second information being for  
10 controlling communications in said one or more second areas;  
means for assigning third information to one or more third  
smaller areas of one or more second areas, said third information  
for controlling communications in said one or more third areas,  
wherein the information of each area is defined as the  
15 information of the next largest area plus or minus the specific  
information for that area.

According to a third aspect of the present invention there is  
provided a communications system for providing communications  
20 over a first area, said system comprising means for assigning  
first information to said first area, said first information  
being for controlling communications in said first area; means  
for assigning second information to one or more second smaller  
areas of said first area, said second information being for  
25 controlling communications in said one or more second areas;  
means for assigning third information to one or more third  
smaller areas of one or more second areas, said third information  
for controlling communications in said one or more third areas,  
wherein a communications element is controlled in accordance with  
30 the first, second or third information in dependence on a  
parameter of the said or another communications element.

According to a fourth aspect of the present invention there is  
provided a communications system for providing communications  
35 over a first area, said system comprising means for assigning  
first information to said first area, said first information  
being for controlling communications in said first area; means  
for assigning second information to one or more second smaller  
areas of said first area, said second information being for  
40 controlling communications in said one or more second areas;  
means for assigning third information to one or more third

5 smaller areas of one or more second areas, said third information  
for controlling communications in said one or more third areas,  
wherein a communications element is controlled in accordance with  
the first, second or third information in dependence on a  
parameter of said communications system.

10

According to a fifth aspect of the present invention there is  
provided a communications system for providing communications  
over a first area, said system comprises means for assigning  
first information to the first area, said first information being  
15 for controlling communications in said first area; means for  
assigning second information to one or more second smaller areas  
of said first area, said second information being for controlling  
communications in said one or more second areas, wherein the  
position of a communications device is arranged to be determined,  
20 the accuracy of the determination of the position of the user  
determining if the device is controlled in accordance with the  
first or second information.

According to a sixth aspect of the present invention there is  
25 provided a communications system for providing communications  
over a first area, said system comprising means for assigning  
first information to said first area, said first information  
being for controlling communications in said first area; means  
for assigning second information to one or more second smaller  
30 areas of said first area, said second information being for  
controlling communications in said one or more second areas;  
wherein the information of the second area is defined as the  
information of the first area plus or minus the specific  
information for the second area.

35

According to a seventh aspect of the present invention there is  
provided a communications system for providing communications  
over a first area, said system comprising means for assigning  
first information to said first area, said first information  
40 being for controlling communications in said first area; means  
for assigning second information to one or more second smaller

5 areas of said first area, said second information being for controlling communications in said one or more second areas; wherein a communications device in said area is controlled in accordance with the first or second information in dependence on a parameter of said communications device.

10

According to an eighth aspect of the present invention there is provided a communications system for providing communications over a first area, said system comprising means for assigning first information to said first area, said first information being for controlling communications in the first area; means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas, wherein a communications device in the area is controlled in accordance 15 with the first or second information in dependence on a parameter 20 of the communications system.

According to a ninth aspect of the present invention there is provided a method for providing communications over a first area, 25 said method comprising assigning first information to the first area, the first information being for controlling communications in said first area; assigning second information to one or more second smaller areas of the first area, said second information being for controlling communication in said one or more second 30 areas; assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas: determining the position of a communications device; and in accordance with the accuracy of the determination, determining if 35 the device is controlled in accordance with the first, second and/or third information.

According to a tenth aspect of the present invention there is provided a method for providing communication over a first area, 40 said method comprising the steps of assigning first information to the first area, said first information being for controlling

5 communications in said first area; assigning second information to one or more second smaller areas of the first area, said second information being for controlling communications in said one or more second areas; assigning third information to one or more third smaller areas of one or more second areas, said third  
10 information for controlling communications in said one or more third areas; and defining the information of each area as the information of the next largest area plus or minus specific information for that area.

15 According to an eleventh aspect of the present invention there is provided a method for providing communications over a first area, said method comprising assigning first information to the first area, said first information being for controlling communications in said first area; assigning second information to one or more second smaller areas of the first area, said second information being for controlling communications in said one or more second areas; means for assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas;  
20 and controlling the communication device in said area in accordance with the first, second or third information in dependence on a parameter of the communications device.  
25

According to a twelfth aspect of the present invention there is provided a method for providing communications over a first area, said method comprising the steps of assigning first information to the first area, said first information being for controlling communications in the first area; assigning second information to one or more second smaller areas of the first area, said second  
30 information being for controlling communications; assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas; and controlling a communications device in said area in accordance with the first,  
35 second or third information in dependence on a parameter of said communications system.  
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5

According to a thirteenth aspect of the present invention there is provided apparatus for controlling a communications apparatus for use in a communications system, said apparatus comprising means for storing information dividing a first area into one or 10 more second smaller areas, said one or more second smaller areas being divided into one or more third smaller areas, said apparatus storing information associated with said first area, information associated with said one or more second areas and information associated with said one or more third smaller areas, 15 said apparatus being arranged to control a communications device in accordance with said position of said communications device and said information.

According to a fourteenth aspect of the present invention there 20 is provided a first station arranged to communicate with a plurality of second stations, said first station being arranged to receive information relating to an event, said first station being arranged to alter its function in response to the occurrence of said event.

25

#### BRIEF DESCRIPTION OF DRAWINGS

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made 30 by way of example to the accompanying drawings in which:

Figure 1 shows a schematic diagram of part of a cellular telecommunications network incorporating base transceiver stations and mobile stations;

35 Figure 2 illustrates an operating principle of an embodiment of the invention; and

Figure 3 illustrates the scheme of Figure 4 in more detail.

Figure 4a shows an embodiment of the invention in which the mobile station is switched into a mode in which the mobile 40 station can only receive, based on the location of the mobile station;

5 Figure 4b shows an embodiment of the invention in which the mobile station is switched into a mode in which the mobile station can only receive, based on the receipt of a trigger signal;

10 Figure 4c shows another embodiment of the invention in which the mobile station is switched into a mode in which the mobile station can only receive, based on the receipt of a trigger signal;

15 Figure 5a shows a first mobile station embodying the present invention; and

Figure 5b shows a second mobile station embodying the present invention.

#### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION**

20 Reference will first be made to Figure 1 in which three cells 2 of a cellular telecommunications network are shown. Each cell 2 is served by a respective base transceiver station (BTS) 4. Each base transceiver station 4 is arranged to transmit signals to and receive signals from the mobile stations 6 located in the cell 25 associated with the given base transceiver station 4. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4.

30 The cellular telecommunications network shown in Figure 1 uses a code division multiple access technique but can use any other suitable access technique.

Reference will now be made to Figure 2 which shows in more detail a method embodying the present invention. In this method, based 35 on the position of the mobile station, the network will automatically enable, disable and/or cause certain functions of the mobile station to be performed in dependence on the actual position of the user. A decision made by the network as to whether or not to alter any functions of a mobile station 100 40 will depend on previously defined priorities of operation in different regions of the cell. These previously defined

5 priorities are known by the network. With the ability of the base transceiver station 102 to determine the position of the mobile station, the operation of a mobile station can be changed, as outlined previously, so that a number of common priorities, for a given operation area are fulfilled. For example, if the  
10 coordinates of a given mobile station, as measured by a base transceiver station, indicate that the user is located in a hospital building, as determined by the radio network control 104 from the information received from the base transceiver station 102, then the operation of the mobile station 100 could be  
15 disabled as outlined above. Of course it is also possible that the user in question may have an additional priority which permits the user to continue to use the mobile station in the hospital. Typically, emergency or medical staff may be permitted to continue to use their mobile stations in the hospital.

20

In the arrangement shown in Figure 2, the base transceiver station determines the location, for example, the coordinates, of the mobile station using any suitable method. It is of course possible but not necessary that the mobile station could assist  
25 in this operation or indeed provide the required location information. For example, if the mobile station included a GPS (Global Positioning System) receiver then the mobile station could assist the base station in determining the location of the mobile station.

30

The mobile station can determine its position in any suitable manner or may be advised of its position by the network. The mobile station position can be determined for example using:

35

a) GPS (geosynchronous positioning satellites). With this technique the mobile station uses signals received from a number of these satellites to determine its position. The principles of triangulation can be used to determine the position of the mobile station. If this method is used, the mobile station will need to have the capability to receive the GPS signals. Accordingly a separate GPS receiver may be provided;

5

b) another technique involves the use of timing advance information. Timing advance information is sent by a base station to a mobile station instructing the mobile station when to transmit so the transmitted signal from the mobile station to the base station is in its allocated time slot. The timing advance information for a given mobile station will vary in accordance with the distance between the mobile station and the base station. The timing advance information is therefore a measure of distance. Additional directional information may be required in order to determine the absolute position of the mobile station;

c) Doppler shift information can be used if the mobile station is moving. This allows the direction in which the mobile station is located to be determined;

d) another method for locating a mobile station where the mobile station is in communication with more than one base station is as follows: The mobile station will send a reference signal to each of the base stations with which it communicates. Each of the base stations effectively records the time when the signal is received from the mobile station. This information is passed to a controller such as a radio network controller which upstream of the base stations along with information from the mobile station as to when the signal was transmitted. The time taken for the different base stations to receive the signal provides a measure of the distance of the mobile station from each of the base stations. Using this information, it is possible to locate the position of the mobile station. The accuracy of the measurement will depend on the number of base stations with which the mobile station is in communication; and/or

e) the mobile station may make the measurements in order to determine the position thereof. Each base transceiver station with which the mobile station is in communication sends a signal to the mobile station. These signals from each of the base

5 stations may be sent at the same time or in succession. The mobile station obtains an observed time difference between each pair of base stations. The observed time difference can be obtained in two different ways. Firstly, the base stations can be controlled by a controller such as a radio network controller to  
10 transmit signals to the mobile station at the same time. The mobile station is then able to measure the difference in the timing of the received signal from each of the base stations. Alternatively, the mobile station can measure the difference between the signal from each base transceiver station and the  
15 mobile station's internal time base and the observed timing difference can be calculated from this information. The mobile station location estimate can be calculated from the observed time differences based on the fact that the possible location for the mobile station observing a constant observed time difference  
20 between two base stations is a hyperbola. The mobile station can be located in the intersection of two hyperbolas obtained for example with three base stations and two observed time difference measurements. If more observed time differences are available from more base stations, the size of the location area in which  
25 the mobile station is possibly located can be reduced.

In the above methods information obtained by the mobile station may be analysed in the mobile station or passed back to a controller such as the radio network controller or to a base  
30 station for analysis. The analysing element may also have information on the real time difference between the neighbouring base stations. In the case of a synchronous network, the real time difference will be zero.

35 These methods of determining the location of the mobile station can be used singly or in any combination.

The base station transmits the coordinates to the radio network control 104. From maps and classification of the operating area  
40 105 which the radio network control 104 has access to or is stored in the radio network control, the radio network control

5 104 is able to determine to which region the mobile station belongs. The radio network determines from the region to which the mobile station belongs which functions the mobile station is to perform. Information on the functions is transmitted to the mobile station via the base station.

10

In the following, the term function will be used to encompass tasks, processors, procedures or defined actions carried out by the mobile station and/or the base station.

15 As shown in Figure 2 and more clearly in Figure .3, the area operation of a network may be divided into a number of smaller sub areas. In principle, but not necessarily, these smaller sub areas are non-overlapping. These areas will be referred to as regions 106 and are shown in Figure 3. Each region is in turn  
20 divided into a number of smaller regions 108. Each of these smaller regions 108 is in turn made up of still further regions 110. The numbers of layers is influenced by the maximum resolution of the used positioning system. For example, a individual building or an individual room within a building may  
25 be the smallest defined region 110.

Each area or region is characterised by a given set of user priorities. In a typical example, large amounts of the total area or region will be defined as restriction free regions. Within  
30 these areas, the mobile station functions are available and controlled by the user, as normal. For example, these restriction free areas may include open spaces, parks, roads, residential areas and so on.

35 It should be appreciated that the arrangement of Figure 3 includes three different hierarchical levels. The first level 112 has the largest regions, the next level 114 has the next smallest regions and the third level 116 has the smallest regions. It should be appreciated that in alternative embodiments of the  
40 present invention, fewer than three levels or more than three levels may be provided. It should be appreciated that the regions

5 in one of the levels may correspond to cell areas. However, this  
is not essential.

With the hierarchy illustrated in Figure 3, consider the relatively large region 118 in the first layer 112. This region  
10 118 will have a given set of priorities which are imposed by the network. As can be seen from level 114, region 118 of the first level 112 is divided into a number of regions. In a preferred embodiment of the present invention, these smaller regions 120 inherit the same priorities as the larger region 118 of which  
15 they form a part. These smaller regions may include additional or fewer priorities. It is particularly advantageous if the priorities of the smaller regions are based on the priorities of the larger region of which it forms a part as this assists in the processing. The same may be true with the regions of the third  
20 level 116 which are based on the regions of the second level 114.

In alternative embodiments of the present invention, each smaller region can be defined as having its own set of priorities, without taking into account those of the larger region of which  
25 it forms a part.

In embodiments of the present invention, the function of the mobile station can be altered in a number of ways. For example, the network may totally block the mobile station so that the  
30 mobile station is unable to transmit or to receive. Alternatively, the mobile station can have its transmitter disabled, as will be discussed in more detail later. In this mode, the mobile station can receive messages but cannot send messages. A third possibility is to disable the sound so that all  
35 functions of the mobile station which generate a loud sound signal are disabled. For example, the mobile station is prevented from providing an audible sound.

It is also possible that functions effect data transfer. For  
40 example, the mobile station can be controlled to download or upload data or alternatively, these functions can be disabled.

5 Alternatively, enable and disable operations may be performed based on the data rate or transfer type, for example if there is packet/circuit switched data, video data etc.

10 It is also possible that commercial operations could be enabled or disabled. For example, when the user enters a particular area, the user may send or receive advertisement signals or the like.

15 The mobile station may alternatively be forced to provide a function. For example, a mobile station may be forced to send a common alarm message or to receive common emergency information or the like.

20 It is possible that audio and/or video signal blocking in either or both directions of communications of the mobile station can also occur in embodiments of the present invention.

In embodiments of the present invention, it is preferred that the network is responsible for controlling the operation. This is represented by the radio network control of Figure 2. The base station 102 measures the coordinates of the user and/or the mobile station measures its location by itself. Various examples of techniques for identifying the location of the mobile station will be described later. The network 104 is arranged to keep track of the movements of the mobile station 100 and to determine the area or region in which a given mobile station is operating at a given time. In other words, the radio network control 104 will know in which region the mobile station is located in respect of each of the hierarchical levels. Alternatively, the radio network controller may only be concerned with the location of the mobile station in respect of the highest level. For some mobile stations, the radio network control will not be able to determine the location of the mobile station with sufficient accuracy. The radio network control may therefore use the highest level available for the level of accuracy with which the position of the mobile station can be determined.

5 As the radio network controller tracks the movement of the mobile station, it may become necessary for the mobile station to send a control message to the mobile station if the mobile station has entered a particular region. This message sends commands to the mobile terminal in order to cause it to be enabled, disabled, or  
10 to perform a particular function.

In some embodiments of the present invention, some control commands can be masked by the user, according to the user priority. An example of this is that doctors in a hospital may be  
15 permitted to use their mobile stations while other people may not. However, this masking can also be done on a time basis so that particular users may not be permitted to use their mobile stations at particular times. This may be in conjunction with specified areas or not.

20 It should be appreciated that in some embodiments of the present invention, some control commands would be non-maskable so that all users within a certain area would be effected by the control signals provided by the radio network control 108. In some  
25 embodiments of the present invention, the control commands are location dependent.

However, in alternative embodiments of the present invention,  
30 this method can be used with parameters other than location. For example, the mobile stations can be controlled in accordance with one or more of the following alternative or additional conditions:-

Network conditions - for example if the local loading has  
35 exceeded or fallen below a given level;

Equipment conditions - for example allowing the enabling and disabling due to a special requirement of the mobile station or base station such as failure or error;

User Conditions - disabling, enabling or causing a particular function to be performed for a particular user or group of users;  
40 Events - For example causing a mobile station to be enabled or

16

5 disabled during a particular occasion such as a concert or the like; and

Time-causing the mobile station to be sent a message enabling it or disabling it or causing it to perform a particular function at a particular period of time.

10

The method embodying the invention will be described briefly. When a mobile station first attaches to the network, the first location update is carried out. After determining the subregion and operating mode of priorities associated with the area or 15 region in which the mobile station is located, the network sends a control message to a mobile station. The message transfer may be a packet type so there could be a dedicated message for this purpose. However, any other suitable method may be used to transfer the message. The message will contain in a control 20 format the information of the permitted and nonpermitted functions in the area or region in which the particular user is operating.

In some embodiments of the present invention, the structure of 25 the control format can be organised in a way that a bit position in the message corresponds to a particular function and the value of the bit advises the mobile station as to whether or not the function is to be performed or not. The length of the message may not be restricted and may have any suitable length.

30

A new control message is only sent to the mobile station when the mobile station enters a new operation area, where the control is location related. If the control is time related, then the message will be sent at the beginning of the time to which the 35 message applies. It is of course possible that the control messages be repeated, possibly but not necessarily at regular time intervals.

A mobile station can be arranged to know which bits correspond to 40 which operations or functions so that it can perform the correct functions and translate the control message into a clear format.

5 This format may be used to advise a user as to which operations  
are enabled and disabled. In some situations, a user may have the  
right to prevent some enabling or disabling operators. It should  
be appreciated that the user may not be permitted to prevent  
particular functions depending on the location of the user and/or  
10 any one or more of the other conditions described previously. Of  
course, there will be situations where certain users may be  
permitted to override any of the control instructions.

As the original operational region is divided into a plurality of  
15 sub areas and various sub areas have various functions associated  
therewith, there will not be a uniform distribution of resources.  
For example, in an area containing a hospital, the number of  
mobile stations permitted to operate will be relatively low. The  
resource allocation can be managed by the radio network control  
20 so as to take into account those areas where loading is low and  
allocate additional resources to those areas with high loading.

In one of the embodiments of the invention, the mobile station  
has a total blocking or total disabling function. With the total  
25 blocking function, all contact with the mobile station is lost  
and it is therefore possible that the base station may not be  
able to determine the position of the mobile station. To avoid  
this, the mobile station may, in certain embodiments of the  
present invention or in certain conditions be permitted to  
30 transmit a minimum amount of information from time to time.  
Alternatively, the total blocking may be valid for a fixed or  
random amount of time after which the mobile station will re-  
establish the link with the base station. Once the position of  
the mobile station is updated, the associated action may be taken  
35 including once again blocking and/or disabling all of the  
functions of the mobile station.

It should be appreciated that in the embodiment of the present  
invention, the region and associated information which is used  
40 will depend on the accuracy with which the position of the mobile  
station can be determined.

5

The regions of the second layer 114 may completely cover the region of the first layer 112. However, this is not essential. Likewise, the third layer may completely or only partially cover a region of the second layer 114. It is possible for one region 10 to overlap two or more regions in the next higher level. However, it is preferred that each smaller region be completely contained in a higher level region.

In an alternative embodiment of the invention, the layer 15 information used by the mobile station may depend on a parameter of the mobile station or the system. For example, the parameter may be the location of the mobile station, the identity of the communications device, the type of the communications device or any other suitable parameter.

20

It is alternatively possible for the layer information used by the mobile station to be selected in dependence on a parameter of the communication system for example time or the network conditions.

25

In summary, the Network takes care of the management of certain mobile station functions in response to certain (pre-determined) events. Management or control means disabling, enabling, blocking, forcing, setting, reconfiguring, activating, deactivating, changing, etc. Additionally, the mobile itself could take of its management, either autonomously or in conjunction (that is in co-operation) with the network. In this context, network means the base station and/or the higher level functions above the base station, e.g., base station controller, 30 etc. Moreover, auxiliary equipment (i.e. an autonomous or a network controlled local transmitter) can act as the managing element. This auxiliary equipment can be geographically fixed or mobile. Finally, this controlling equipment can also be attached to a mobile station or it could be an integral part of it. In 35 this last case a mobile station could be able to control other mobile stations with lower priorities operating within a certain 40

5 predefined or ``protected'' area.

The mobile station functions to be controlled included one or more of the following:

10 • Transmitter/receiver/transceiver operation (switch  
on/switch off)

• Ringing sounds

• Multimedia functions: text, video, data, etc.

• Receiver/transmitter configurations

15 • Optimization of transmitter and/or receive parameters.

One additional function could be the supporting of the formation of adhoc networks where communications between mobile stations take place directly without the intervention of the base station.

20 This will generally occur when two or more mobile stations are physically close to each other.

Events creating changes in the functions can be mobile station location in conjunction with other events. Alternatively or 25 additionally, the change in function can be in response to time, type of information to be transmitted/received, loading or traffic conditions, hardware failure, etc.

Another triggering event may be the absolute speed of a given 30 mobile station or the relative speed between the two mobile stations.

Priorities and hierarchies of both the mobile station location and user types are used to facilitate the control of mobile 35 station functions and to make the management flexible and versatile.

The functions performed by the mobile station are in general controlled by the network but additionally or alternatively they 40 can be controlled by the mobile station itself, co-operatively by the base station and the mobile station, by one or more mobile

5 stations (excluding the operating mobile station being controlled) and auxiliary fixed or mobile equipment (autonomous or controlled by the network). The auxiliary equipment can be a device produced and/or a local service provided by a third party. The functions may be controlled by the base station and/or one or  
10 more network elements.

If a given number of mobile stations are within a certain area in which certain functions are modified, the signalling commands can be transmitted in a multicast or broadcast mode instead of  
15 controlling each mobile station separately.

It is possible additionally or alternatively to control and/or manage base station functions and/or the functions of other network elements in a similar way to the control and/or management of mobile stations described previously. For example  
20 radio resource management functions can be controlled and/or managed. In other words, upon the occurrence of a given event (for example a mobile station enters a given region or any of the events discussed in relation to mobile stations previously) the  
25 base station and/or network element can modify its own internal functions. Some of these functions may be similar to those described in relation to mobile stations hereinbefore. For example, network level functions, which can be controlled or managed are as follows: transmitter/receiver operations -  
30 reconfiguration of the transmit and receive system may take place altering the architecture circuitry etc; radio resource management functions may also be altered, that is admission control, load control, power control, diversity control or the like; access mode control can also be altered, for example switching between CDMA, TDMA, FDMA and so on; and duplexing mode  
35 may be controlled so as to operate with a frequency division duplex FDD mode or a time division duplex TDD mode.

Reference will now be made to Figure 4 which shows an alternative embodiment of the invention. In this arrangement, a cell is shown  
40 in which a hospital is located. The embodiment shown in Figure 4

21.

5 may be, but not necessarily, used in conjunction with the arrangement described previously. In the following description, control may be taken by the network, for example the base station.

10 Reference will now be made to Figure 4 which shows a cell 12 in which a hospital 14 is located. The embodiments described can be used in conjunction with the arrangement of Figures 2 and 3 or independently thereof. The mobile station 16 is arranged so that its transmitter is switched off but not its receiver when the 15 mobile station is in the hospital. There are a number of ways in which it can be determined whether or not the transmitter should be switched off, but not the receiver. Outside the hospital, the mobile station 16 will be able to transmit signals and receive signals.

20 Firstly as shown in Figure 4, the location of the mobile station in the cell can be used.

25 When the mobile station 16 enters the cell, it is advised of the geographical location of the hospital by the base station 18. The information provided by the base station 18 can be in any suitable form. For example the information can take the form of coordinates for the hospital, a mixture of coordinates and an algorithm or just an algorithm. Key coordinates 20 may be defined 30 for the hospital from which the area covered by the hospital can be determined.

35 The mobile station uses information on its own position to determine whether it is in the defined area of the hospital and therefore needs to switch off its transmitter.

40 Alternatively, the base station can monitor the position of the mobile station and send a trigger signal to the mobile station to switch off its transmitter, but not its receiver, when the mobile station enters the defined area of the hospital.

5 The base station may be arranged to send a message to the mobile station when it is determined that the mobile station is no longer in the hospital instructing the mobile station to switch back on its transmitter.

10 If the mobile station determines that it is no longer in the hospital, the mobile station will be arranged to switch back to the mode in which it is able to receive and transmit signals to the base station.

15 In an alternative embodiment, illustrated in Figure 4b, the transmitter of the mobile station is switched off in response to a trigger signal. This trigger signal is only received by the mobile station when it is in the vicinity (indicated by reference numeral 24) of a transmitter 22 of the trigger signal. This 20 transmitter 22 of the trigger signal will thus transmit with much lower power than a typical base station so that the signal is only received by the mobile station when it is in the immediate vicinity 24 of the transmitter 22. This is so that mobile stations which are not close to the hospital do not have their 25 transmitter turned off by accident.

This transmitter 22 is conveniently located next to an entrance of the hospital. Such a transmitter 22 could be provided next to every entrance to the hospital. In this way, a user of a mobile 30 station would automatically have the mobile station switched to the mode in which the mobile station cannot transmit when the user enters the hospital.

The transmitter 22 can use the same frequency band which is used 35 for normal communications with the base station 18. Alternatively a different frequency range can be used. For example a "Bluetooth" (LPRF=low power radio frequency) module can be used. This proposal uses a low power radio frequency signal which is different from that used for communications with the base 40 station. The frequency used may be in a range which depends on the output power of the transmitter 22 and on the sensitivity of

5 the receiver. The frequency may be in the GHz range.

A second transmitter 26 is provided to switch the transmitter of  
the mobile station back on when the mobile station 16 has left  
the hospital. This second transmitter 26 can be omitted and the  
10 user would then have to switch the mobile station back on to a  
transmitting mode manually. Where, the second transmitter 26 is  
provided, its range is such that the mobile station will not  
receive signals from the first and second transmitters 22 and 26  
at the same time. The second transmitter 26 may be located so  
15 that when the user leaves the hospital, the user has to pass  
through the area 28 of coverage of the second transmitter 26.

Reference is now made to Figure 5a which shows one example of a  
schematic view of a first mobile station 16. The mobile station  
20 16 has a receiver 30 and a transmitter 32. The receiver 30 is  
arranged to receive signals via antenna 34 from the base station  
18 and/or from the first transmitter 22 and/or the second  
transmitter 26. The transmitter 32 is arranged to transmit  
signals to the base station 18. The receiver 30 and the  
25 transmitter 32 are connected to a processor 36 which processes  
received signals from the receiver 20 and processes signals to be  
transmitted.

Mode unit 38 determines if the mobile station should be in the  
30 normal mode where the mobile station is able to transmit and  
receive signals or in the mode where the mobile station is only  
able to receive signals. The mode unit can be modified to deal  
with any of the described methods for ascertaining the mode of  
the mobile station outlined hereinbefore. The mode unit 38 may  
35 constitute part of the processor 36. The mode unit 38 outputs a  
signal to a control unit 40 which controls the transmitter. When  
it is determined that the mobile station should not transmit, the  
control unit 40 controls the transmitter 32 to prevent  
transmission. The control unit 38 may form part of the processor  
40 36 and the processor 36 prevents the transmitter 32 from  
transmitting.

5

Figure 5b shows a second mobile station embodying the present invention. Those parts which are the same as shown in Figure 5a are referred to by the same reference numerals. The mobile station shown in Figure 5b has a second receiver 44 connected to a second antenna 46 for receiving trigger signals which are in a different frequency band to that used by the base station 18.

In one modification to the above described embodiments, certain users may be permitted to use their mobile station within the hospital. This would require a register at a suitable location, for example in the base station or upstream network element which lists all of the mobile stations which are permitted to operate within the hospital. This may be as shown in Figures 2 or 3. The transmitters of these mobile stations would not be switched off. For example, doctors could be permitted to transmit in the hospital environment in order to respond to emergency calls.

The embodiments described hereinbefore may be modified to only permit certain types of calls within the hospital. For example, the user could be permitted to make emergency calls or the like. Likewise certain users may be permitted to receive certain calls such as from an administrative centre of the hospital or the like. This modification may be implemented by the provision of a register at a suitable location, for example in the base station or an upstream network controller.

It should be appreciated that because the mobile station continues to receive communications from the base station, when the transmitter is turned back on the mobile station will have network system information from the base stations already available. The mobile station does not need to perform network selection and location update. Thus normal operations which need to be carried out when the mobile station is first switched on can be avoided as the receiver of the mobile station has not been switched off so that the mobile station was still able to receive all the broadcasted system information.

5

In some embodiments of the present invention, when the transmitter of the mobile station has been switched off because the user has entered the hospital, the mobile station may be controlled to provide a message to the user that he will not be able to use his mobile station. The message can be displayed on the display or can be an audible message.

In some embodiments of the invention, the mobile station may be arranged to switch off its transmitter and its receiver when it enters an environment in which it is not permitted to operate. In a further embodiment, the mobile station may be controlled to be switched off completely when entering certain environments and in other environments to only prevent the transmitter from transmitting.

20

In one modification to the invention shown in Figure 4c, a transmitter 29 is arranged to transmit a signal 31 which can be received throughout the hospital. This signal 31 is not receivable outside the immediate vicinity of the hospital. When the mobile station 16 receives this signal, it automatically switches to the mode in which it can receive signals but cannot transmit signals. As soon as the mobile station 16 leaves the hospital 14 and can no longer receive the signal 31 from the transmitter 29, the mobile station 16 switches back to the normal mode in which it can receive and transmit signals. The transmitter 29 may use the same or a different frequency band to that used by the base station 18.

In an alternative embodiment of the present invention, the mobile station may be provided with a first transmitter and a second transmitter. The first transmitter is used for transmitting signals to the base station. The second transmitter can be used to transmit signals to a relay station in the hospital. The frequency used by the second transmitter is selected to be one which does not interfere with any equipment in the hospital. Alternatively or additionally, the power used by the second

5 transmitter may be much lower than that required by the first  
transmitter.

The embodiments of Figures 4 and 5 have been described in the context of a hospital. It should be appreciated that the 10 embodiments of the present invention can be used in any other suitable context such as aeroplanes, petrol stations, theatres, conference rooms and the like.

It should be appreciated that in some embodiments of the 15 invention, the mobile station will not always have its transmitter switched off when it enters a designated area. For example, if embodiments of the invention were used in the context of theatres, the mobile station may only have its transmitter switched off for the duration of the performance. At other times, 20 the mobile station may work normally. Any of the control described in relation to the arrangement of Figures 2 and 3 can be used in the arrangement of Figures 3 and 4.

The preferred embodiment of the present invention has been 25 described in the context of a mobile station. It should be appreciated that the mobile station may be a mobile phone or any other suitable piece of equipment. In those embodiments where the areas in which a terminal is permitted to be used changes, the terminal may be a fixed terminal.

30 Whilst preferred embodiments have been described in the context of a code division multiple access system, embodiments of the present invention can be used with any other spread spectrum technique or any other suitable access technique such as time 35 division multiple access, frequency division multiple and space division multiple access as well as hybrids thereof.

## 5 CLAIMS

1. A communications system for providing communications over a first area, said system comprising:  
means for assigning first information to said first area, said first information being for controlling communications in said first area;  
means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas;  
means for assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas, wherein the position of a communications device is arranged to be determined, the accuracy of the determination of the position of the user determining if one or more elements of said communications system is controlled in accordance with the first, second and/or third information.
2. A communications system as claimed in claim 1, wherein said first area is only partially covered by said one or more second areas.
3. A communications system as claimed in claim 1, wherein the first area is fully covered by a plurality of second areas.
4. A communications system as claimed in any preceding claim, wherein at least one of the at least one second area is contained in the first area.
- 35 5. A communications system as claimed in any of claims 1 to 4, wherein at least one of the at least one second area is only partially contained in said first area.
6. A communications system as claimed in any preceding claim, wherein one or more of the at least one second area is only partially covered by said one or more third areas.

5

7. A communications system as claimed in any preceding claim, wherein one or more of the at least one second area is fully covered by a plurality of third areas.

10 8. A communications system as claimed in any preceding claim, wherein at least one of the at least one third area is contained in an associated second area.

15 9. A communications system as claimed in any preceding claim, wherein at least one of the at least one third area is only partially contained in an associated second area.

20 10. A communications system as claimed in any preceding claim, wherein the information associated with each area is arranged to control said communications element.

11. A communications system as claimed in claim 10, wherein said one or more elements is controllable by said information to perform one or more of the following functions:

25 switch off; enable the element, disable the element; turn off a transmitter; disable operations generating sound; enabling video and/or multimedia signals; disabling video and/or multimedia signals; send advertisements; receive advertisements; send a message; receive a message; enable data operations; disable data  
30 operations; enable and/or disable multimedia and/or video functions, light related operations, electrical switching operations, and/or mechanical related operations; optimise receiver and/or transmitter parameters; and form an adhoc network between one or more communication devices.

35

12. A communications system as claimed in any preceding claim, wherein the information of each area is defined as the information of the next largest area plus or minus the specific information for that area.

40

5 13. A communications system as claimed in any preceding claim  
wherein said communications system is a wireless system.

10 14. A communications system as claimed in any preceding claim,  
wherein said communications system is a cellular  
telecommunications system.

15 15. A communications system as claimed in claim 14, wherein said  
first area comprises a cell.

15 16. A communications system as claimed in any preceding claim,  
wherein said communications device comprises one of a mobile  
telephone, and user equipment.

20 17. A communications system as claimed in any preceding claim,  
wherein said information comprises one or more of the following:  
information defining when the element is to be controlled; where  
the element is to be controlled; if the particular element is to  
be controlled based on the identity of the element; if the  
particular element is to be controlled based on the type of the  
25 element; if the particular element is to be controlled based on  
conditions of the communications system; if the particular  
element is to be controlled based on the priority of the element;  
if the particular element is to be controlled based on radio  
conditions; if the particular element is to be controlled based  
30 on the condition of one or more network elements; the speed of  
the element; and the relative speed between elements.

35 18. A communication system as claimed in any preceding claim,  
wherein a plurality of elements are controlled with a common  
signal.

19. A communication system as claimed in any preceding claim,  
wherein said element comprises: said communication device; a base  
station; or a network element of said communications system.

5 20. A communications system for providing communications over a first area, said system comprising:  
means for assigning first information to said first area, said first information being for controlling communications in said first area;

10 means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas;  
means for assigning third information to one or more third smaller areas of one or more second areas, said third information  
15 for controlling communications in said one or more third areas,  
wherein the information of each area is defined as the information of the next largest area plus or minus the specific information for that area.

20 21. A communications system for providing communications over a first area, said system comprising:  
means for assigning first information to said first area, said first information being for controlling communications in said first area;

25 means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas;  
means for assigning third information to one or more third smaller areas of one or more second areas, said third information  
30 for controlling communications in said one or more third areas,  
wherein a communications element is controlled in accordance with the first, second or third information in dependence on a parameter of the said or another communications element.

35 22. A communications system as claimed in claim 21, wherein said parameter is the location of the communications element.

23. A communications system as claimed in claim 21 or 22,  
wherein the parameter is the accuracy with which the location of  
40 the communications element is known.

5 24. A communications system as claimed in claim 21, 22 or 23,  
wherein the parameter is the identity of the communications  
element.

10 25. A communications system as claimed in any of claims 21 to  
24, wherein the parameter is the type of communications element.

26. A communications system for providing communications over a  
first area, said system comprising:  
means for assigning first information to said first area, said  
15 first information being for controlling communications in said  
first area;  
means for assigning second information to one or more second  
smaller areas of said first area, said second information being  
for controlling communications in said one or more second areas;  
20 means for assigning third information to one or more third  
smaller areas of one or more second areas, said third information  
for controlling communications in said one or more third areas,  
wherein a communications element is controlled in accordance with  
the first, second or third information in dependence on a  
25 parameter of said communications system.

27. A communications system as claimed in claim 26, wherein said  
parameter is time.

30 28. A communications system as claimed in claim 26 or 27,  
wherein the parameter is the communication conditions of said  
communications system.

29. A communications system as claimed in any of claims 21 to 25  
35 wherein said communications element comprises: a communications  
device; a mobile station; a base station; or a network element of  
said communications system.

30. A communications system as claimed in any of claims 1 to 29  
40 wherein the communications element is controlled by a different  
communications element.

5

31. A communications system as claimed in any of claims 1 to 30 wherein the communications element is controlled by said device itself.

10 32. A communications system as claimed in any of claims 1 to 31 wherein the communications element is controlled by an element external to said communication system.

15 33. A communications system as claimed in any of claims 1 to 32 wherein the communications element is controlled by a service external to said communication system.

20 34. A communications system as claimed in any of claims 1 to 33 wherein the communications element is controlled by at least one network element of said communications system.

35. A communications system for providing communications over a first area, said system comprises:

25 means for assigning first information to the first area, said first information being for controlling communications in said first area;

30 means for assigning second information to one or more second smaller areas of said first area, said second information being for controlling communications in said one or more second areas, wherein the position of a communications device is arranged to be determined, the accuracy of the determination of the position of the user determining if the device is controlled in accordance with the first or second information.

35 36. A communications system for providing communications over a first area, said system comprising:

means for assigning first information to said first area, said first information being for controlling communications in said first area;

40 means for assigning second information to one or more second smaller areas of said first area, said second information being

5 for controlling communications in said one or more second areas;  
wherein the information of the second area is defined as the  
information of the first area plus or minus the specific  
information for the second area.

10 37. A communications system for providing communications over a  
first area, said system comprising:

means for assigning first information to said first area,  
said first information being for controlling communications in  
said first area;

15 means for assigning second information to one or more second  
smaller areas of said first area, said second information being  
for controlling communications in said one or more second areas;  
wherein a communications device in said area is controlled  
in accordance with the first or second information in dependence  
20 on a parameter of said communications device.

38. A communications system for providing communications over a  
first area, said system comprising:

means for assigning first information to said first area,  
25 said first information being for controlling communications in  
the first area;

means for assigning second information to one or more second  
smaller areas of said first area, said second information being  
for controlling communications in said one or more second areas,  
30 wherein a communications device in the area is controlled in  
accordance with the first or second information in dependence on  
a parameter of the communications system.

39. A method for providing communications over a first area,  
35 said method comprising:

assigning first information to the first area, the first  
information being for controlling communications in said first  
area;

40 assigning second information to one or more second smaller  
areas of the first area, said second information being for  
controlling communication in said one or more second areas;

5 assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas:

10 determining the position of a communications device; and  
determining if the device is controlled in accordance with the first, second and/or third information.

40. A method for providing communication over a first area, said method comprising the steps of:

15 assigning first information to the first area, said first information being for controlling communications in said first area;

20 assigning second information to one or more second smaller areas of the first area, said second information being for controlling communications in said one or more second areas;

assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas; and

25 defining the information of each area as the information of the next largest area plus or minus specific information for that area.

41. A method for providing communications over a first area, said method comprising:

30 assigning first information to the first area, said first information being for controlling communications in said first area;

35 assigning second information to one or more second smaller areas of the first area, said second information being for controlling communications in said one or more second areas;

means for assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas; and

40 controlling the communication device in said area in accordance with the first, second or third information in

5 dependence on a parameter of the communications device.

42. A method for providing communications over a first area, said method comprising the steps of:

10 assigning first information to the first area, said first information being for controlling communications in the first area;

assigning second information to one or more second smaller areas of the first area, said second information being for controlling communications;

15 assigning third information to one or more third smaller areas of one or more second areas, said third information for controlling communications in said one or more third areas; and

20 controlling a communications device in said area in accordance with the first, second or third information in dependence on a parameter of said communications system.

43 Apparatus for controlling a communications apparatus for use in a communications system, said apparatus comprising means for storing information dividing a first area into one or more second smaller areas, said one or more second smaller areas being divided into one or more third smaller areas, said apparatus storing information associated with said first area, information associated with said one or more second areas and information associated with said one or more third smaller areas, said apparatus being arranged to control a communications device in accordance with said position of said communications device and said information.

44. A communications apparatus as claimed in claim 43, wherein  
35 said apparatus is a radio network controller.

45. A first station arranged to communicate with a plurality of second stations, said first station being arranged to receive information relating to an event, said first station being  
40 arranged to alter its function in response to the occurrence of said event.

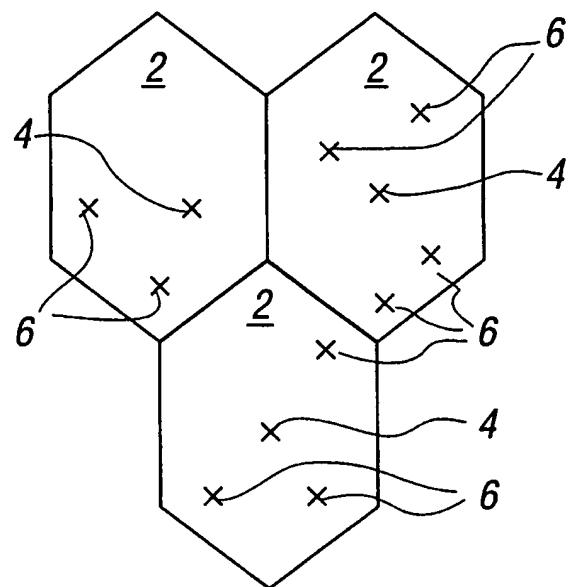


FIG. 1

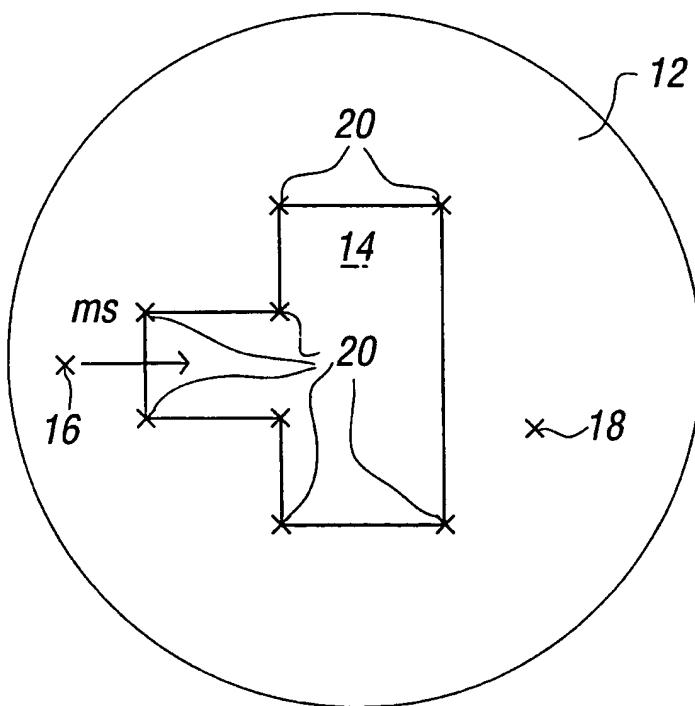
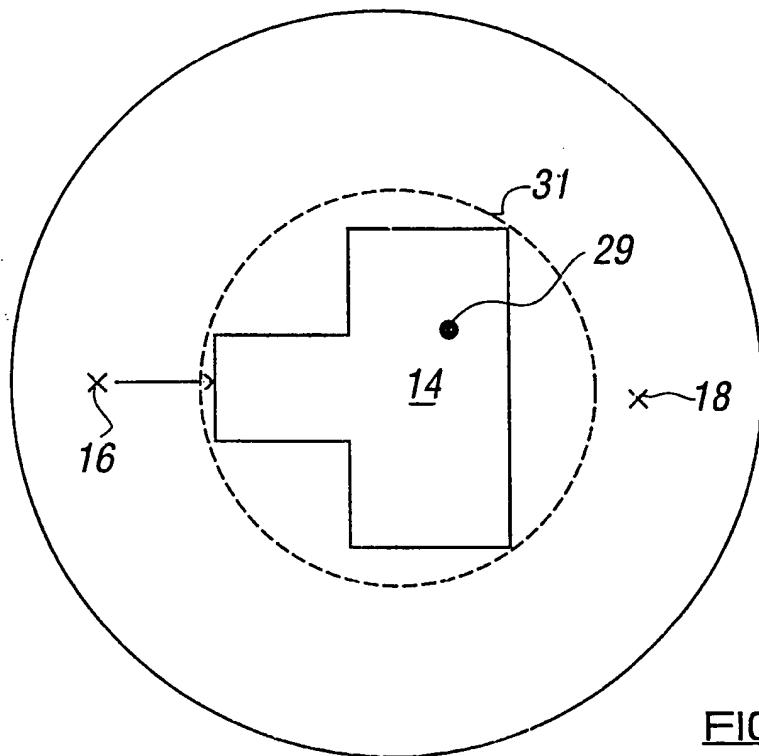
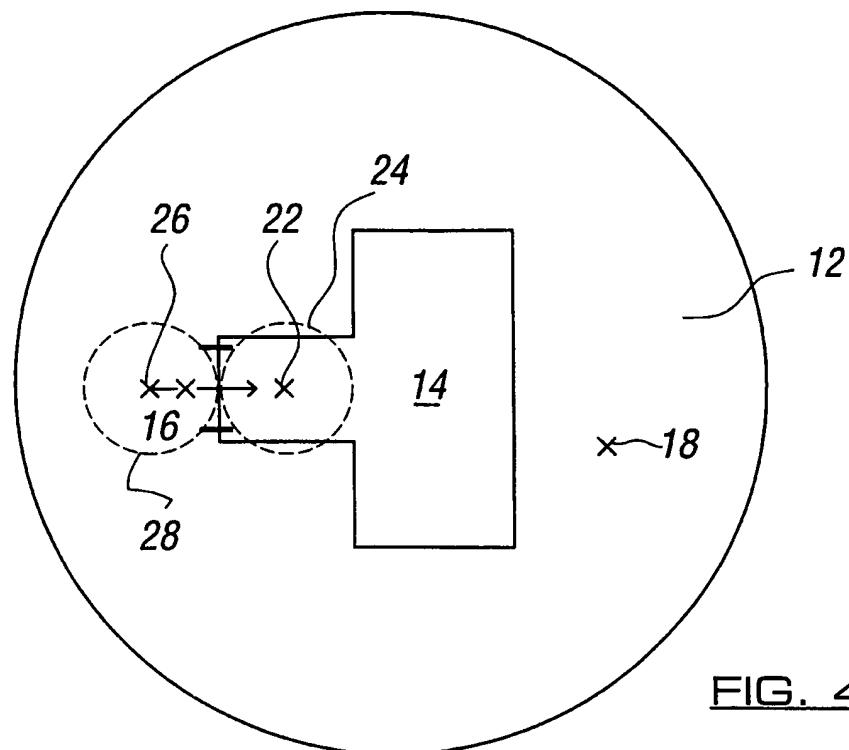
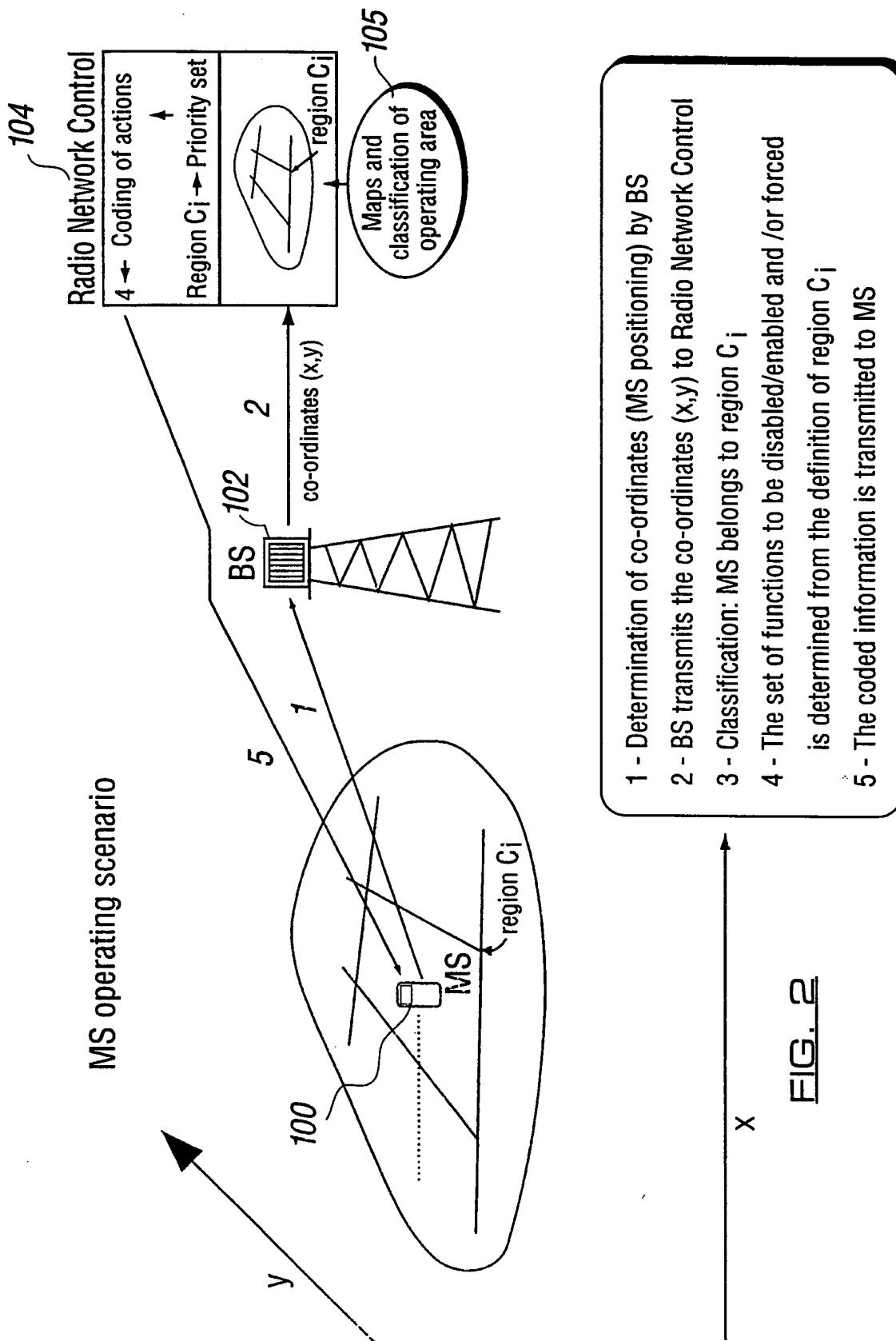


FIG. 4A



3/5



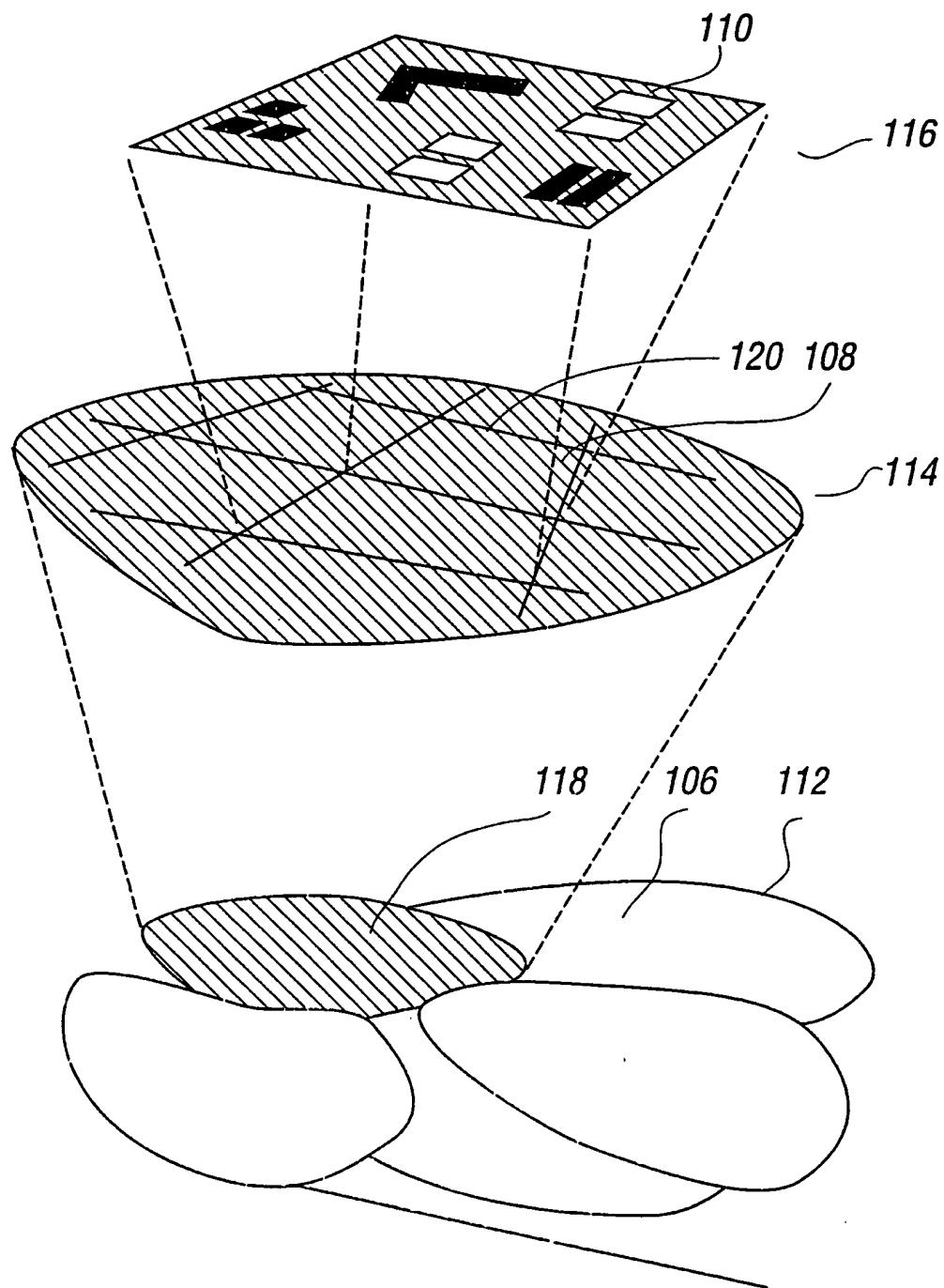
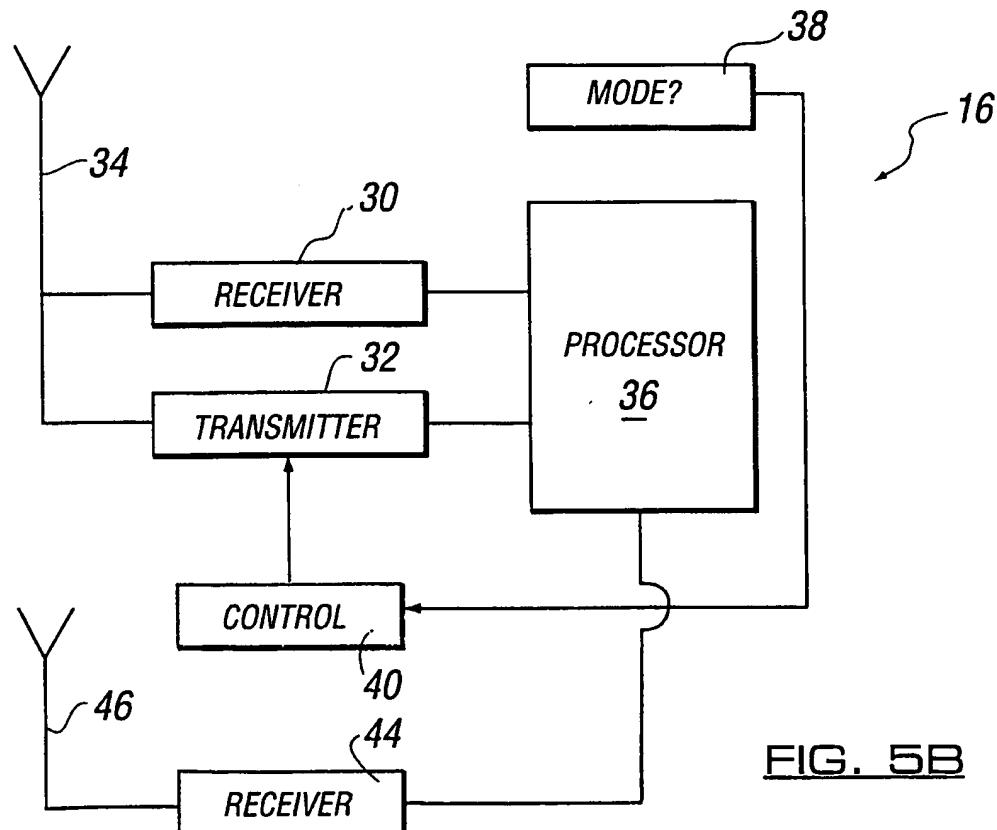
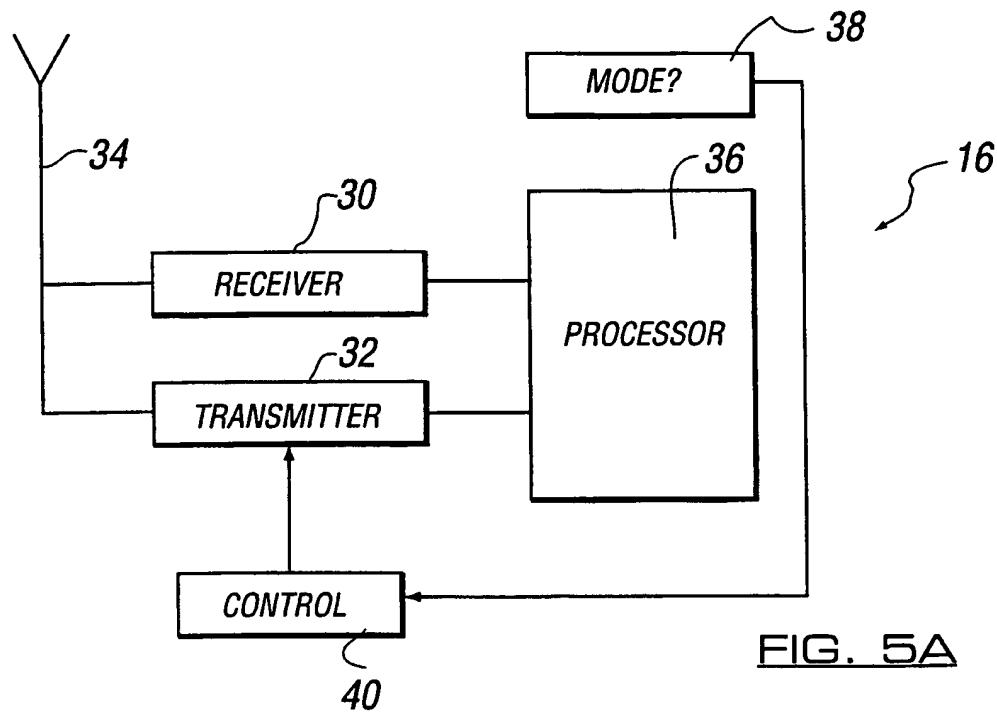


FIG. 3



# INTERNATIONAL SEARCH REPORT

Int'l Application No  
PCT/EP 00/03486

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 H04Q/38

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 891 110 A (ALSTHOM CGE ALCATEL) 13 January 1999 (1999-01-13)  column 4, line 25 -column 6, line 13	20-22, 24-27, 29, 36-38, 40-45
X	US 5 778 304 A (GRUBE GARY W ET AL) 7 July 1998 (1998-07-07)	20-22, 29,36, 37,40, 41,43,45
A	column 2, line 13 -column 4, line 29  -	1-19,30, 31,35, 38,39, 42,44  -/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 September 2000

Date of mailing of the international search report

19/09/2000

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International Application No
PCT/EP 00/03486

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